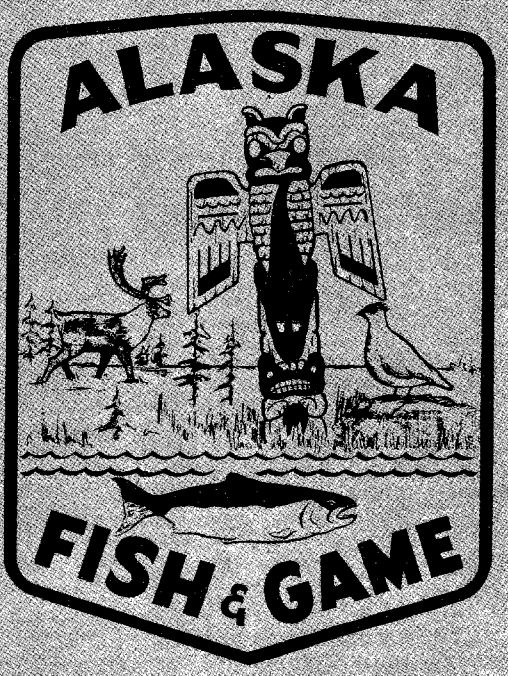
Informational Leaflet 155

A SUMMARY OF PRELIMINARY 1972 FORECASTS FOR ALASKAN SALMON FISHERIES

Prepared by:

Division of Commercial Fisheries
ALASKA DEPARTMENT OF FISH AND GAME

November 15, 1971



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November 15, 1971

FOREWORD

by

Wallace H. Noerenberg, Commissioner

ALASKA DEPARTMENT OF FISH AND GAME

With a harvest of 46 million salmon and the receipt of an estimated 50 million dollars by fishermen participating in the 1971 Alaska fishing season, total returns to salmon fishermen since the State assumed management of its fisheries in 1960 reached the $500 million mark. These fishing dollars have contributed substantially to the basic economy of people living in Alaska's coastal villages and towns from Ketchikan in Southeastern Alaska to the Bering Sea village of Kotzebue. Not only have fishermen benefited from these salmon harvests but also numerous people annually employed in non-fishing capacities in the fishing industry.

In its second annual statewide salmon forecast, released in November of 1970, the Department projected a 1971 harvest of 41.5 million salmon of all species. The close agreement between this projection and the actual harvest of 46 million provides a sense of achievement for the Department which considers one of its major responsibilities of fisheries management as that of providing pre-season information on anticipated harvest levels.

As to be expected when making a composite forecast, agreement between the projected and actual total harvest benefited to some degree from a balancing of deviations occurring in individual area forecasts. However, in general, area forecasts exhibited sufficient accuracy to be of value from a practical fisheries management standpoint.

These pre-season forecasts provide information needed by fishermen and processors for operational planning and by the Board of Fish and Game and the Department for the development of regulations necessary for achievement of maximum sustained harvests. Data obtained from forecast studies also contributes substantially to other aspects of fisheries management such as the estimation of optimum escapement levels. Although some reduction in individual fisherman catch can occasionally result from an influx of fishermen into an area following an optimistic forecast, this disadvantage of forecasting is far outweighed by additional harvests made possible when pre-season forecasts for a large harvest allow expansion of processing facilities to handle larger than normal catches. To cite a specific example -- failure to have anticipated the unusually large pink salmon return to Prince William Sound in 1971 could conceivably have reduced the harvest by some two million salmon -- the number of fish actually shipped to other areas for processing when local facilities were unable to accommodate them. In other instances, the Department through appropriate regulations can allow additional harvest from specific salmon stocks which, on the basis of forecast studies, are expected to be especially strong.

The Department remains hopeful that the Constitutional amendment proposition developed by Governor Egan and approved by the 1971 Session of the Legislature, which would amend the exclusive right of fisheries clause, will ultimately provide relief for the problem of excessive fishing effort in the salmon fisheries. Affirmative action by the electorate in November, 1972 in adopting the proposed Constitutional amendment should provide the impetus for development by the State of a comprehensive, long-range fishing gear limitation program. The development of such a program may have the added benefit of preventing the influx of additional fishermen into areas for which good salmon runs have been forecasted.

The 1971 harvest of 46 million salmon of all species exceeds comparable odd-year average catches of 37 million in the 1950's and 42 million in the 1960's. Good to excellent escapements achieved generally throughout the State suggest that the 1971 run may have been even stronger than indicated by comparison of past commercial catches. Worthy of special mention in the 1971 season were (1) the 7.3 million pink salmon harvest in Prince William Sound, best since 1947, (2) the exceptionally strong pink salmon escapements achieved in Southeastern Alaska which provide an opportunity to rebuild recently weak odd-year pink salmon runs to this area and (3) the second consecutive sockeye harvest in excess of one million for Chignik fisheries, an event which has not occurred since 1921-22. From a forecasting standpoint, the occurrence of only several percent error in the prediction of a 15 million red salmon return to Bristol Bay was especially encouraging.

Looking forward to next year, a commercial harvest of nearly 50 million salmon of all species is projected for the 1972 season. This projection is heavily dependent on predicted pink salmon harvests totaling approximately 23 million from Southeastern Alaska and Kodiak fisheries. The Department cautions that a larger than normal difference between projected and actual statewide salmon harvest could result from this major dependence on two areas should returns to either of these areas differ substantially from forecasted levels. Unusually weak returns predicted for both Prince William Sound pink salmon and Chignik red salmon will require special sacrifices, in the form of reduced fishing time, by fishermen to prevent these poor returns from being perpetuated into the next cycle. Information on projected harvests for other areas is contained in this leaflet.

The Department views the future of Alaska's fisheries with great optimism. Total returns to fishermen from salmon harvested in Alaska since 1960 should reach the $1 billion mark by the early 1980's. We are not naive, however, in thinking that these returns can be obtained at little or no cost. Great investments have been made in the past and must be continued if Alaska's fisheries are to defy the too frequent rule of decline exhibited by many major fisheries throughout the world. Although we take satisfaction from gains made since the poor years of the 1950's, we shall continue to strive for achievement of the maximum sustainable harvest Alaska's salmon can produce. We feel that, conservatively, the average annual harvest of salmon could exceed 75 million fish. The Department staff, although well-trained and highly dedicated, cannot achieve the above goals without the full support of the citizens of this State.

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INTRODUCTION

This is the third in a series of annual reports prepared by the Division of Commercial Fisheries, Alaska Department of Fish and Game, for the purpose of presenting preliminary pre-season forecasts for Alaskan salmon fisheries. Released in November, these publications make available information on salmon returns expected the following year to some major fisheries throughout the state. A projection is also made for the total state salmon harvest.

The first formal statewide salmon forecast, published in November 1969, predicted a 1970 state salmon harvest of 96 million. Falling substantially short of this projection, the 1970 commercial harvest totaled 68 million salmon of all species. In 1971, a harvest of 46 million salmon only slightly surpassed the second statewide forecast of 42 million.

To make pre-season forecast information available at this time requires the use of preliminary data collected during the season just ended. Special attention is drawn to the use of very preliminary data on commercial catches of salmon during the past season. Differences, although generally minor, will exist between data presented in this report and final data being compiled.

Salmon forecasts in this leaflet are also presented under preliminary status. Revision of data on which these forecasts are based and further analysis may require modification of preliminary forecasts. However, in the past, preliminary forecasts have not differed substantially from final forecasts. Final forecasts are published by the Department and/or are made available via the news media.

Terminology and Definitions

Definitions of some key terms frequently used in this report are as follows:

Return, run - the total number of salmon returning in a given year to Alaskan waters from ocean rearing areas. A portion of these returning salmon is normally harvested while the remaining fish are allowed to reach the spawning grounds.

Commercial catch, harvest - that portion of a returning salmon run harvested by commercial fisheries.

Escapement, spawning population, brood stock - that portion of a returning salmon run which is not harvested and survives to reach the spawning grounds.

Different common names are often used for a specific species of salmon. The scientific names and most frequently used common names for the five species of Pacific salmon are given below:

Scientific Name	Common Name
Oncorhynchus tshawytscha	king, chinook
Oncorhynchus nerka	red, sockeye
Oncorhynchus kisutch	coho, silver
Oncorhynchus gorbuscha	pink, humpback, humpy
Oncorhynchus keta	chum, dog, keta

The three regions used for the purpose of this report are the statistical regions by which commercial fisheries statistics are presented in the Department's Statistical Leaflet series and in prior statistical reports. The boundaries of these regions are shown in Figure 1 and are defined as follows:

SOUTHEASTERN: Dixon Entrance to Cape Suckling (including the Southeastern Alaska and Yakutat areas).

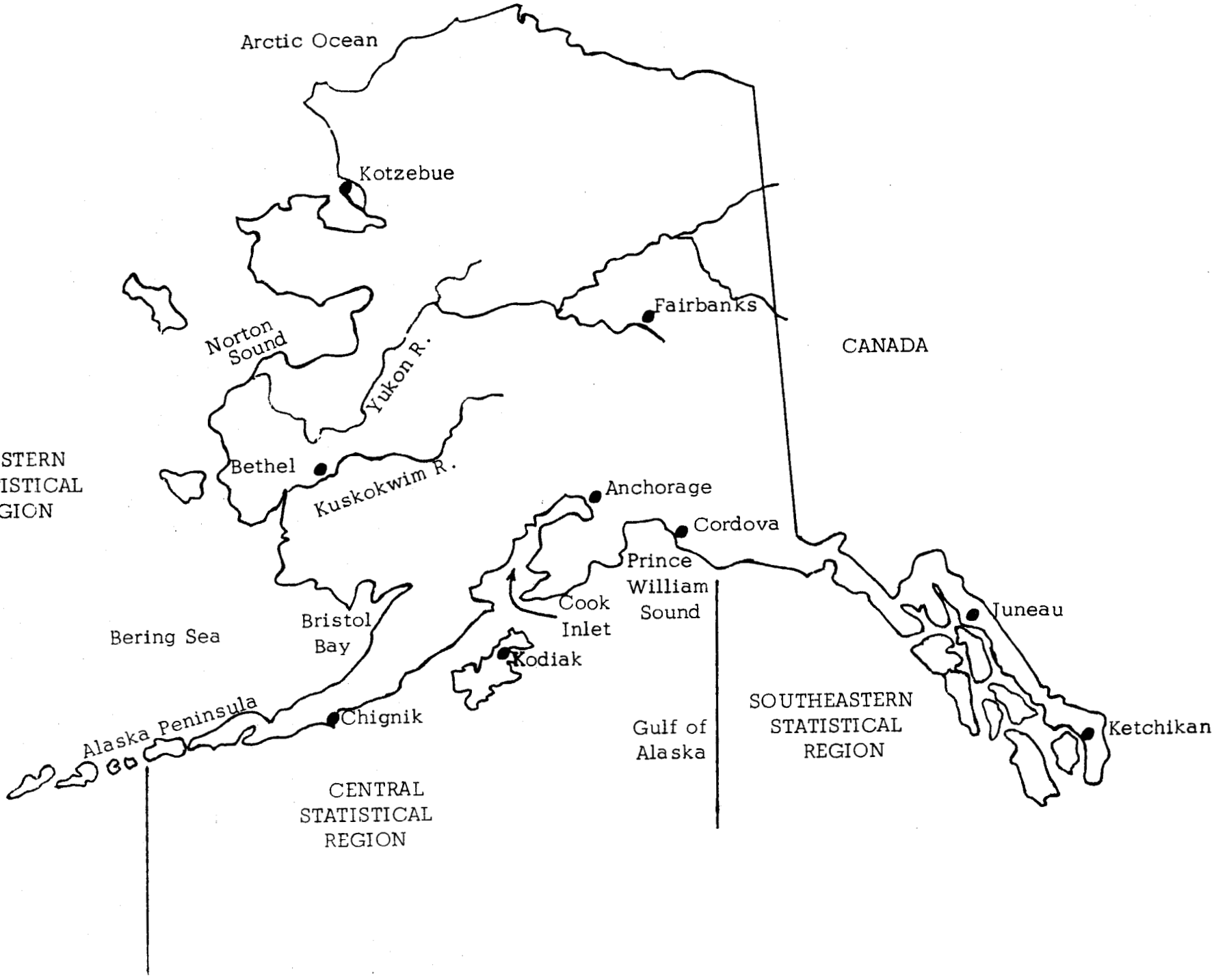
CENTRAL: Cape Suckling to Seal Cape on the southwestern tip of Unimak Island (including the Copper River-Bering Rivers, Prince William Sound, Cook Inlet, Kodiak, Chignik and South Side Alaska Peninsula areas).

WESTERN: Seal Cape to, and including, the Aleutian Islands and the Bering Sea north through Kotzebue Sound (including the Aleutian Islands, North Side Alaska Peninsula, Bristol Bay, and Arctic-Yukon-Kuskokwim areas).

Acknowledgments

Materials presented in this report were prepared by Division of Commercial Fisheries biologists located in field offices throughout the state. Area biologists, not individually identified, contributed the materials for the discussion of the 1971 fishing season. Individual credit for forecast materials is given following the specific area forecasts in Appendix A.

FIGURE 1. ALASKA DEPARTMENT OF FISH AND GAME COMMERCIAL FISHERIES STATISTICAL REGIONS.



HIGHLIGHTS OF THE 1971 SEASON

The 1971 Alaska commercial harvest of 46.0 million salmon - based on preliminary reports - exceeded the pre-season projected harvest of 41.5 million by roughly 10 percent or 4.5 million fish. In view of the apprehension which developed early in the season as the result of later than normal arrival of salmon at some major fisheries, the opportunity for additional harvest was especially gratifying.

The variation of ten percent between projected and actual harvest was well within the range of acceptable or expected variation for salmon predictions. Furthermore, fishing and processing operations generally functioned smoothly with no major interruptions due to strikes, inclement weather, overburdened processing facilities or other problems which often plague commercial fisheries.

Commercial catches of salmon by species and fishing area for 1971 are presented in Table 1. These data are based on preliminary reports and can be expected to change slightly as final catch statistics are compiled.

Harvests larger than forecast did not occur consistently throughout the state in 1971. The larger statewide salmon harvest was primarily the results of stronger than anticipated returns to two major fisheries. Pink salmon returns to Southern Southeastern Alaska and Prince William Sound significantly exceeded pre-season predictions and contributed to the harvest approximately 8.7 million fish more than expected. Also on the plus side, harvests of chum salmon in all areas except Bristol Bay exceeded pre-season projections and contributed an additional 2.6 million fish.

Salmon runs to two major fisheries fell substantially short of expectations. In Northern Southeastern Alaska a weaker than expected pink salmon return required additional restriction of harvest to achieve desired escapements; subsequently a 2.9 million harvest was realized rather than the expected 5.0 million. In Kodiak a pink salmon return roughly 35 percent below predictions resulted in a harvest of 4.3 million, approximately 2.7 million less than projected. However, on a statewide basis, these weaknesses were overbalanced by the stronger pink salmon returns to Southern Southeastern and Prince William Sound and generally stronger chum runs throughout the state.

Outstanding events of the 1971 season would include the exceptionally strong pink salmon return to Prince William Sound which resulted in a 7.4 million harvest, largest since 1947 when 8.1 million pinks were harvested. Achievement of good pink salmon escapements throughout most areas of South-

TABLE 1. PRELIMINARY [1/] 1971 ALASKA COMMERCIAL SALMON HARVEST BY SPECIES AND MAJOR FISHING AREAS

Number of Fish in Thousands

Area	Species					
	King	Red	Coho	Pink	Chum	Total
Southeastern Alaska	271	493	608	9,007	1,529	11,908
Yakutat	2	127	34	81	5	249
SOUTHEASTERN REGION SUBTOTAL	273	620	642	9,088	1,534	12,157
Prince William Sound	17	743	322	7,361	582	9,025
Cook Inlet	19	657	105	428	473	1,682
Kodiak	1	479	21	4,331	1,537	6,369
Chignik	2	1,017	15	612	354	2,000
Alaska Peninsula - S. Side	2	716	17	1,477	1,366	3,578
CENTRAL REGION SUBTOTAL	41	3,612	480	14,209	4,312	22,654
Alaska Peninsula - N. Side and Aleutian Islands	2	355	7	46	64	474
Bristol Bay	115	9,258	12	-	482	9,867
Arctic-Yukon-Kuskokwim	155	6	25	5	656	847
WESTERN REGION SUBTOTAL	272	9,619	44	51	1,202	11,188
Total Alaska	586	13,851	1,166	23,348	7,048	45,999

1/ This data is based on preliminary reports of commercial catches of salmon. Final commercial catch statistics are presently being compiled from fish tickets and will become available in approximately six months.

eastern Alaska was especially encouraging as this provides an opportunity, if overwinter survival is good, to reverse the recent trend of weakness in odd-year runs to these fisheries. Finally, the exceptional accuracy of red salmon forecasts for Bristol Bay red salmon runs was encouraging as the total run of approximately 15.5 million fish exceeded the 15.2 million prediction by only several hundred thousand fish. Individual river system forecasts for Bristol Bay also reflected exceptionally good agreement with actual returns.

Additional comments on commercial fisheries of major areas throughout the state are presented below.

Southeastern Alaska and Yakutat

On the basis of weak pre-season forecasts for the predominant pink salmon runs, restricted fishing was anticipated for both Northern and Southern Southeastern fisheries. The policy of the Department in 1971 was to sufficiently restrict fishing to insure good escapements in hopes of reversing recently depressed odd-year pink salmon runs. Commensurate with this policy and to protect early run pink salmon stocks, major purse seine fisheries in Northern Southeastern were scheduled for a July 18 opening, some 2-3 weeks later than normal. A forecasted return of only 4.3 million pink salmon to Southern Southeastern dictated that only limited, if any, fishing time would be possible, consequently a fixed opening date was not set but was to be announced by emergency regulation if warranted.

Fewer pink salmon returned to Northern Southeastern than predicted with approximately 2.9 million fish being harvested as compared to a pre-season projection of 5.0 million. However, in Southern Southeastern intensive monitoring of pink salmon returning to these waters indicated that by the second week in August escapements were developing strongly and limited fishing was allowed at that time. Subsequent fishing on the stronger than expected returns to the Southern Section resulted in a harvest of approximately 6.0 million pink salmon. Pink salmon escapements were generally good for Southeastern streams and should provide the potential for some recovery from recently depressed odd-year runs.

Commercial catches of 273,000 king and 1,534,000 chums in 1971 compared favorably with the average harvests of 286,000 kings and 1,669,000 chums during the ten-year period 1961-70.

Catches of 620,000 sockeye and 642,000 coho fell below the 1961-70 averages of 849,000 sockeye and 1,124,000 coho.

Yakutat fisheries harvested a near-average total of approximately 250,000 salmon of all species with exceptionally strong sockeye runs in this area contributing approximately half of the total catch.

Prince William Sound

As in other areas of the state, the 1971 Prince William Sound - Copper River fishing season was characterized by unusually cold weather, cold stream temperatures and the resulting later than normal timing of salmon runs. Some salmon runs returned as much as 2-4 weeks later than normal.

In spite of unusual climatological conditions, fishermen harvested (approximately 7.4 million pinks, the largest catch of this species since 1947.) The predominant purse seine fishery commenced on July 12 and continued until August 16. With the exception of the Northwestern District, which experienced returns below normal levels, pink salmon returns to other districts were generally good to excellent. Despite a weak pre-season prediction, the Montague District experienced a strong return with escapements comparing favorably with pre-earthquake levels. Pink salmon escapements to most districts were good to excellent; preliminary estimates indicated approximately 1.7 million fish reached the spawning grounds.

In addition to excellent pink salmon catches, fishermen and processors enjoyed the best chum harvest since 1963 as some 577,000 chums were harvested in 1971. The majority of these fish were produced by Eastern District streams.

Despite a two-week delay in fishing caused by price negotiations and unfavorable weather conditions which hampered fishing operations during the first week (May 31-June 6), approximately 617,000 red salmon were harvested by the Copper River fishery. Nearly 300,000 salmon were harvested during the first week of fishing. Indications of excellent red salmon escapements for the Copper River and delta streams suggest that although the harvest was about average the total return of salmon to these systems was probably above average.

Cook Inlet

Preliminary reports show a commercial harvest in 1971 of 1.7 million salmon of all species by Cook Inlet fishermen. This represents roughly five percent of the total statewide salmon harvest.

Sockeye and pink salmon contributed approximately 65 percent of the total Cook Inlet salmon harvest. A catch of 657,000 sockeye slightly exceeded half the level of the average sockeye catch of 1.2 million during the 1960's. Additional restrictive measures on fishing time, while reducing the commercial harvest of sockeye below recent average levels, resulted in satisfactory sockeye escapements in all rivers surveyed in the Cook Inlet area. The 428,000 pink salmon harvest in 1971 substantially exceeded the 268,000 average odd-year harvest of the 1960's. Pink salmon escapements in the Southern and Outer districts were good to excellent in 1971. The chum harvest of 473,000 fish fell below the levels of the 1960's when an average of 715,000 chums were harvested annually.

Additionally, some 20,000 kings and 105,000 coho were harvested commercially in Cook Inlet fisheries in 1971.

Kodiak

The 4.3 million harvest of pink salmon, predominant species in the Kodiak fisheries, fell short of the pre-season forecast of seven million fish. Weak returns to the Eastside systems contributed to the area wide weakness.

While red salmon catches for this area were generally weak and Karluk experienced its worst red run in the history of this fishery, a record escapement of 55,000 red salmon were counted into the Frazer Lake system.

Especially strong in 1971, chum runs produced a 1.5 million harvest, largest recorded catch of this species in the history of the Kodiak fisheries.

Chignik

The 1971 harvest of approximately 1.3 million sockeye from Chignik Lake systems marked the second consecutive season that commercial catches from this system have exceeded one million fish. This had not occurred since 1920-21.

Failure by fishermen and processors to reach agreement in price negotiations until July 26 delayed the beginning of fishing in this area by several weeks. By the time fishing had commenced on June 27, red salmon escapement through the Chignik weir exceeded 600,000 fish and had surpassed the Department goal of 400,000 for the early Black Lake system. Subsequent relaxation of fishing restrictions prevented the total Black Lake escapement from exceeding 650,000 sockeye.

Despite the interruption of early season fishing, harvest of Chignik sockeye eventually reached 1.3 million including an estimated 250,000 fish harvested by the Cape Igvak fishery. The total harvest exceeded pre-season forecasts by approximately 300,000 fish. Escapement goals were achieved for both the Black Lake and Chignik Lake systems.

In addition to the predominating sockeye harvest, exceptionally good catches of chum occurred in 1971 with the season catch totaling some 350,000 fish. Approximately 612,000 pink salmon were also taken.

Alaska Peninsula and Aleutian Islands

Pink and chum salmon harvests of approximately 1.5 million each and a one million sockeye harvest contributed the major portion of the four million harvest of all species of salmon by these fisheries in 1971.

Chum salmon returns to the Shumagin-Stepovak-Pavlof area fisheries were the best since 1956. The red salmon harvest of 355,000 by North Peninsula fisheries was also better than average.

Pink salmon runs to the South Peninsula fisheries and king and coho harvests by North Peninsula fisheries were especially weak in 1971.

Only token numbers of salmon were taken by Aleutian Island fisheries where the total harvest of 46,000 salmon of all species was taken at Unalaska.

Bristol Bay

On July 4, the date normally thought of as the peak of the Bristol Bay sockeye fishery, a scoreboard kept by Department biologists showed only 1.3 million fish actually accounted for - a few additional fish could be seen in the rivers - from an expected total inshore return in excess of 15 million. As most major salmon fisheries throughout Alaska had not yet begun, the fact that many salmon runs would be later than normal in 1971 would not be known for several weeks. The substantial apprehension which developed in Bristol Bay was to be expected.

With guarded optimism, Department personnel continued to project a sockeye return comparable with pre-season predictions. These projections were based primarily on (i) data emanating from the Department test fishing vessel operating in the vicinity of Port Moller, (ii) good catches of Bristol Bay sockeye passing through the False Pass fishery and (iii) data on Bristol Bay sockeye abundance obtained during the winter and spring of 1971 by

National Marine Fisheries Service and Fisheries Research Institute (University of Washington) vessels operating on the high seas. Furthermore, the abnormally cold spring temperatures provided a logical explanation for the later than normal migration of sockeye.

Arriving some 7-10 days later than normal, the Bristol Bay sockeye run did meet expectations and preliminary reports accounted for a total inshore return of approximately 15.5 million fish. A harvest of 9.3 million sockeye and escapements totaling 6.2 million compared favorably with pre-season projections of a 9.3 million harvest and 5.9 million escapement. Escapement goals were achieved in all major river systems.

Commercial catches of Bristol Bay sockeye for comparable off-cycle years for the major Kvichak system averaged 6.2 million in the 1950's and 10.6 million in the 1960's. (This data does not include sockeye harvested by Japanese fisheries on the high seas.) Preliminary data indicates a harvest of approximately 800,000 mature Bristol Bay sockeye by Japanese fisheries in 1971.

In addition to the predominant sockeye harvest, Bristol Bay fishermen also harvested approximately 115,000 king salmon and 482,000 chum salmon, the majority of these fish being produced by the Nushagak and Togiak systems.

Arctic-Yukon-Kuskokwim

The 1971 season in the Arctic-Yukon-Kuskokwim region was highlighted by better than average king and chum salmon runs, the economically most important species for this region. Fisherman registration and effort in all fishing areas equaled or exceeded that of previous seasons. Run timing, especially that of king salmon, was 7-10 days later than normal due to unusually low spring temperatures. Pink and coho salmon were below average in abundance.

An excellent king salmon run to the Yukon River produced an above-average harvest of 108,000 fish. Aerial surveys of index spawning areas indicate the 1971 king salmon escapement was the best since 1965. For the third consecutive season, the chum salmon run was above average and the resultant harvest of 289,000 fish was the third greatest recorded for the Yukon fishery.

The Kuskokwim River king salmon run and harvest of 40,000 fish was considered average based on comparative data. The relatively poor coho salmon catch of 5,000 made on the Kuskokwim River resulted from below average fishing effort operating on a below average run. The 1971 season

marked the first commercial chum salmon fishery on this river since the early 1920's; a harvest of approximately 68,000 fish was taken.

The Quinhagak fishery, limited by processing facilities, harvested approximately 36,000 salmon of all species with chums comprising roughly 80 percent of the catch.

Excellent chum salmon runs to the systems of the Norton Sound-Kotzebue area produced a harvest of 270,000 fish and excellent escapements were achieved. The Norton Sound pink salmon run was unusually small.

PRELIMINARY FORECASTS OF TOTAL SALMON RETURNS TO SOME MAJOR ALASKAN FISHERIES IN 1972

The Department's salmon management program includes a number of projects designed to provide pre-season forecasts of total salmon returns to some of the major salmon fisheries throughout the state. Areas and species on which intensified forecast research is presently being conducted were chosen on priority basis relative to economic importance, potential predictability of annual returns and compatibility with existing programs. The Department's forecasting program is being expanded as funding permits.

These intensified forecasting programs are generally designed to provide a more reliable forecasting basis than merely number of spawners in parent years. This may include more refined information on spawning distributions, survival to an intermediate life stage, population age compositions or some combinations of these factors. In addition to forecasts of total salmon returns to an area, information on the relative strength of returns to specific districts or systems obtained from these studies provides for more efficient management of these stocks.

Salmon stocks included in these intensified forecast studies contributed roughly 70 percent of the total statewide salmon harvest in both 1970 and 1971.

Comparison of 1971 Forecasts with Actual Returns

For a brief review of the accuracy of the 1971 forecasts of total returns to these major salmon fisheries, Table 2 compares the preliminary pre-season forecasts of November, 1970 with preliminary 1971 returns. Only minor revisions of the preliminary forecasts were made prior to the 1971 season.

In 1971, deviations between forecasted and actual returns varied from only several percent for Prince William Sound chum salmon and Bristol Bay sockeye salmon to 156 percent for Southern Southeastern pink salmon. The average deviation, ignoring the direction of deviation, was 47 percent. (For clarification of this discussion, percent deviation between forecast and actual return is computed from the forecasted return. An alternate method of expressing forecast error is to compute percent forecast error from the actual return.)

Returns of pink salmon in 1971 to Southern Southeastern and Prince William Sound areas substantially exceeded pre-season predictions. In Southern Southeastern Alaska, a pink salmon return nearly three times the

TABLE 2. A COMPARISON OF 1971 SALMON FORECASTS AND PRELIMINARY 1971 RETURNS TO MAJOR SALMON FISHERIES IN ALASKA FOR WHICH FORECASTS OF TOTAL SALMON RETURNS ARE AVAILABLE[1/]

Number of Fish in Thousands

Area	Species	Pre-Season Forecast[2/]	Preliminary Return	Difference[3/] Number	Difference[3/] Percent
Southern Southeastern Alaska	Pink	4,300	11,000	+6,700	+156
Northern Southeastern Alaska	Pink	8,500	5,550	-2,950	-35
Southeastern Alaska Subtotals	Pink	12,800	16,550	+3,750	+29
Prince William Sound	Pink	5,000-7,400	9,500	+3,300	+53
	Chum	600-920	760	Negligible	
Cook Inlet - Southern and Outer Districts only	Pink	320-640	770	+290	+60
Kodiak	Pink	7,400-8,600	5,400	-2,600	-35
Chignik	Sockeye	1,700	2,300	+600	+35
Bristol Bay	Sockeye	15,900[4/]	15,500	-400	-3

1/ Formal annual forecasts of total salmon returns were made in 1971 only for those species and areas presented above.

2/ These forecasts were released under preliminary status in November, 1970. Only minor revisions were made prior to the 1971 season.

3/ When a forecast range is presented, the midpoint of the range is used to determine forecast error unless preference toward one end of the range is indicated. Percent difference calculated from forecast.

4/ A Western Alaska forecast for 16.9 million red salmon, including an estimated 1 million fish for the north side of the Alaska Peninsula, was mistakenly presented as the preliminary 1971 Bristol Bay forecast in ADF&G Informational Leaflet No. 149.

predicted level materialized, providing for a substantial harvest of approximately 6 million pink salmon where little harvest had been anticipated. Recent intensification of pre-emergent fry sampling in Southeastern Alaska will hopefully reduce the occurrence of such large deviations between forecasts and actual returns. In Prince William Sound, the area which has enjoyed the most successful salmon forecasts in the state, a pink salmon run producing the largest harvest since 1947 exceeded the upper range of the forecast by approximately 2.1 million; the point estimate of 6.2 million pinks were exceeded by roughly 50 percent.

Pink salmon returns in 1971 fell substantially short of pre-season forecasts in the Northern Southeastern and Kodiak areas. A return, based on preliminary data, of 5.6 million to Northern Southeastern Alaska was approximately 35 percent below the forecasted return of 8.5 million. In Kodiak, some 2.9 million pink salmon or 35 percent of the forecasted 8.3 million fish failed to materialize.

The occurrence of only several percent error between the forecasted and actual return of sockeye to Bristol Bay was encouraging, particularly in view of the fact that forecasts to individual systems also agreed closely with actual returns. Failure of the Japanese high seas fisheries to intercept the expected percentage of Bristol Bay sockeye resulted in an additional several million fish reaching the inshore fishery and contributed to the agreement between predicted and actual inshore returns.

Preliminary 1972 Forecasts

Presented in Table 3 are preliminary forecasts of total returns to these major fisheries in 1972. A forecast for the return of pink salmon to the Nushagak district in Bristol Bay has also been included this year. As indicated above, the salmon stocks represented in these forecasts contributed roughly 70 percent of the state salmon harvest for the past two years.

Apparent from Table 3 is the fact that pink salmon returns to the Southeastern Alaska and Kodiak areas are expected to contribute substantially to the 1972 Alaska salmon return. In both of these areas, even-year pink salmon runs have been stronger than odd-year runs in recent years. Jointly, these two areas are expected to contribute approximately 23 million pink salmon to the state salmon harvest.

Additional caution should be exercised relative to the Southeastern Alaska pink salmon forecast. Even-year runs and subsequent harvests for this area have fluctuated substantially; since 1960 even-year harvests have

TABLE 3. PRELIMINARY FORECASTS OF TOTAL SALMON RETURNS TO SOME[1] MAJOR ALASKAN FISHERIES IN 1972.

Number of Fish in Thousands

Area	Species	Forecasted Total Return	Estimated Harvest[2]
Southern Southeastern	Pink	13,000-16,000	8,500
Northern Southeastern	Pink	12,000-14,000	8,000[3]
Southeastern Subtotal	Pink	25,000-30,000	16,500
Prince William Sound	Pink	0-3,600	200
	Chum	700-900	600
Cook Inlet-Southern and Outer Districts Only	Pink	400-1,100	500
Kodiak	Pink	7,900-11,100	6,500
Chignik	Sockeye	860	260
Bristol Bay - All Districts	Sockeye	10,280	5,110
Nushagak District	Pink	1,400	800
Totals[4]		52,790	30,470

1/ Formal annual forecasts of total salmon returns are presently prepared only for those areas and species presented above.

2/ Estimated harvests are obtained by subtracting escapement goals from forecasted total returns. The mid-point of a forecasted range of returns is used unless preference toward one end of the range was indicated from analysis of data. It should be emphasized that the estimated harvests presented here are based on an actual return of the magnitude forecasted. A return smaller than forecasted will require additional restrictions of fishing time to achieve desired escapement goals. Returns larger than forecasted will require relaxation of regulations to allow maximum harvests.

3/ The lower end of the forecasted range is used as the point estimate for the Northern Southeastern forecast.

4/ These totals are only for the areas and species represented above. They do not include all species and all areas of Alaska. Mid-points of ranges are used to calculate the totals unless preference toward one end of the range was indicated. In 1970 and 1971 the salmon stocks represented above contributed approximately 70 percent of the total state salmon harvest.

ranged from 3 million in 1960 to 25 million in 1968. Furthermore, pre-emergent fry sampling, the primary basis for forecasting, has not yet reached desired levels due to the large number of pink salmon producing streams in this area and budgetary restrictions. Past forecasts of pink salmon returns have exhibited considerable deviations from actual returns, the 1970 return falling approximately 40 percent below the forecasted level and the 1971 return exceeding the forecast by 30 percent. Recently intensified sampling plans will not benefit the 1972 forecast and deviation similar to those in 1970 and 1971 could be expected.

In the Kodiak area, an expected return of 7.9-11.1 million pink salmon would provide for a commercial harvest of approximately 6.5 million. This harvest would fall below the average even-year harvest of 10.7 million for the period 1960-1970.

Salmon returns to two major fisheries in 1972 are expected to be at levels which will require unusually restrictive fishing regulations if adequate escapements are to be achieved. In Prince William Sound, the 1972 return of pink salmon is not expected to exceed 3.6 million and may be substantially less. Escapement requirements of 1.0-2.0 million pink salmon for Prince William Sound streams will provide for little, if any, harvest should the 1972 return fall in the middle to lower end of the predicted range. The need to protect unusually weak pink salmon returns while allowing adequate harvest of strong chum salmon returns will intensify management problems in this area.

In the Chignik area, a predicted return of approximately 340,000 sockeye to the Black Lake (or early) system falls below the established escapement requirement of 400,000 fish. Unless the 1972 sockeye return to this system substantially exceeds the forecast, little commercial fishing should be expected prior to July 1 and the estimated 260,000 sockeye harvest for the Chignik area would be taken after July 1 from the Chignik Lake or late run.

A predicted 1972 return of 750,000 pink salmon to the Southern and Outer Districts of Cook Inlet would provide for a harvest of approximately 500,000 salmon in these districts. Because of limitation imposed by extreme weather conditions on pre-emergent fry sampling in the spring of 1971, special attention is drawn to the predicted range of 400,000 to 1.1 million associated with the point forecast of total return. The corresponding range for projected harvest is 150,000 to 850,000 pink salmon.

For Bristol Bay, a predicted 1972 inshore return of 10.3 million sockeye, and a corresponding projected harvest of 5.1 million, represents a relatively average return for a year when the major Kvichak River system is not experiencing a peak cycle return. An anticipated even-year run of 1.4 million pink

salmon to the Nushagak District of Bristol Bay is expected to provide for a pink salmon harvest of approximately 800,000 fish.

In total, a contribution to the 1972 state salmon harvest of approximately 30 million fish is expected from the salmon stocks discussed in this section. Pink salmon runs to Southeastern Alaska and Kodiak and the sockeye run to Bristol Bay are expected to provide all but roughly 5 percent of this contribution.

Additional information on forecast techniques, relative strength of returns to specific districts or systems, potential problems anticipated for the 1972 season and other items of interest are presented in Appendix A of this leaflet.

In the following section, the estimated allowable harvest from the above salmon stocks is combined with the projected harvests from other salmon stocks in the state to provide an estimate of the total state salmon harvest for 1972.

PROJECTED TOTAL COMMERCIAL SALMON HARVEST FOR ALASKAN FISHERIES IN 1972

Pre-season forecasts of salmon runs and anticipated harvests for specific area fisheries are essential to the operational planning of persons directly involved with these fisheries. However, information on the expected total Alaska salmon production is also important to agencies, industries or persons involved in many or all fisheries such as industry suppliers, the transportation industry and the State goverment (for projection of state revenues). Consequently, the Department is continuing efforts to develop a basis for providing useful and accurate pre-season estimates of total state salmon production.

For salmon fisheries not discussed in the previous section, it is generally necessary to base pre-season estimates of harvest on recent harvest trends. Projections based on this method will generally reflect more variation from actual harvests as no adjustment is made for brood stock abundance, a primary factor affecting the magnitude of future returns. However, major fisheries for which forecasts (based on estimates of pre-adult stock abundance) are available, contribute a major portion of the total salmon production and many of the smaller fisheries tend to reflect less year-to-year variation in harvest levels because of relatively low fishing efforts. This should allow for reasonably accurate pre-season projections of total state salmon production.

Projected commercial salmon harvests for Alaskan fisheries in 1972 are presented by species and statistical region in Table 4. A total of 46.7 million salmon of all species is expected in 1972. Pink salmon should contribute approximately 65 percent of the total harvest.

Individual fisheries expected to contribute major portions of the 1972 state harvest are Southeastern pink salmon (35%), Kodiak pink salmon (14%) and Bristol Bay sockeye (11%).

In comparing the projected 1972 harvest with the 1971 harvest (refer to Table 1), total numbers of fish are very similar, differing only by 1.7 million. However, the species composition is different with pink salmon contributing only 51 percent in 1971 compared with an expected 65 percent in 1972. The sockeye contribution is expected to drop from 30 percent in 1971 to 20 percent in 1972, primarily as a result of the smaller return expected for Bristol Bay.

Preliminary 1971 salmon casepack statistics, compiled by the Department's Statistics Section; indicate a total of 2.8 million 48-lb. cases of salmon of all species. The smaller casepack of 2.4 million cases projected for 1972 is the

TABLE 4. PROJECTED TOTAL COMMERCIAL SALMON HARVESTS BY ALASKAN FISHERIES IN 1972 1/

Number of Fish in Thousands

Statistical Region	Species					
	King	Red	Coho	Pink	Chum	Total
Southeastern	300	800	750	16,500	1,000	19,350
Central	30	2,990	670	12,350	3,080	19,120
Western	280	5,370	170	1,140	1,290	8,250
Total Alaska	610	9,160	1,590	29,990	5,370	46,720
Estimated number of 48-lb. cases in thousands 2/	30	630	30	1,420	330	2,440

1/ The above estimates of 1972 salmon harvests were obtained by combining estimates of commercial harvests resulting from the forecasts of total returns to some of the major salmon fisheries (refer to Table 3) with projected harvests of the remaining fisheries based on recent harvest trends.

2/ Although the majority of salmon harvested commercially in Alaska are processed as canned products, a large proportion of the harvest of certain species, in particular king and coho salmon, is processed as fresh/frozen and cured products. The number of cases presented above are not adjusted to include salmon processed by means other than canning, consequently the fish per case ratio indicated in this table may not agree with the actual cannery conversion rate of fish per case. Cases other than 48-lb. cases are converted to an equivalent number of standard 48-lb. cases.

result of the larger contribution of pink salmon, more of which are required to produce one case than salmon of other species.

The estimate of 2.4 million cases of salmon for 1972 is not adjusted for, and does not include, production of fresh, frozen or cured salmon products. Salmon products, other than canned, should consist of 20 to 30 million pounds of salmon of all species.

SUMMARY

Commercial catches of Alaskan salmon since 1950 are given in Appendix B and shown graphically in Figure 2. Annual catches during this period have ranged from 21 million in 1967 to 68 million in 1970. Average annual catches, represented by horizontal bars in Figure 2, were 41 and 51 million for the 1950's and 1960's respectively.

Comparatively, the 1971 harvest of 46 million salmon exceeded the average of the 1950's by 12 percent and fell below the average of the 1960's by 10 percent. Predominance of even-year pink salmon runs to some major fisheries suggests that the 1971 harvest may be more properly compared with the odd-year averages of 37 million for the 1950's and 42 million for the 1960's.

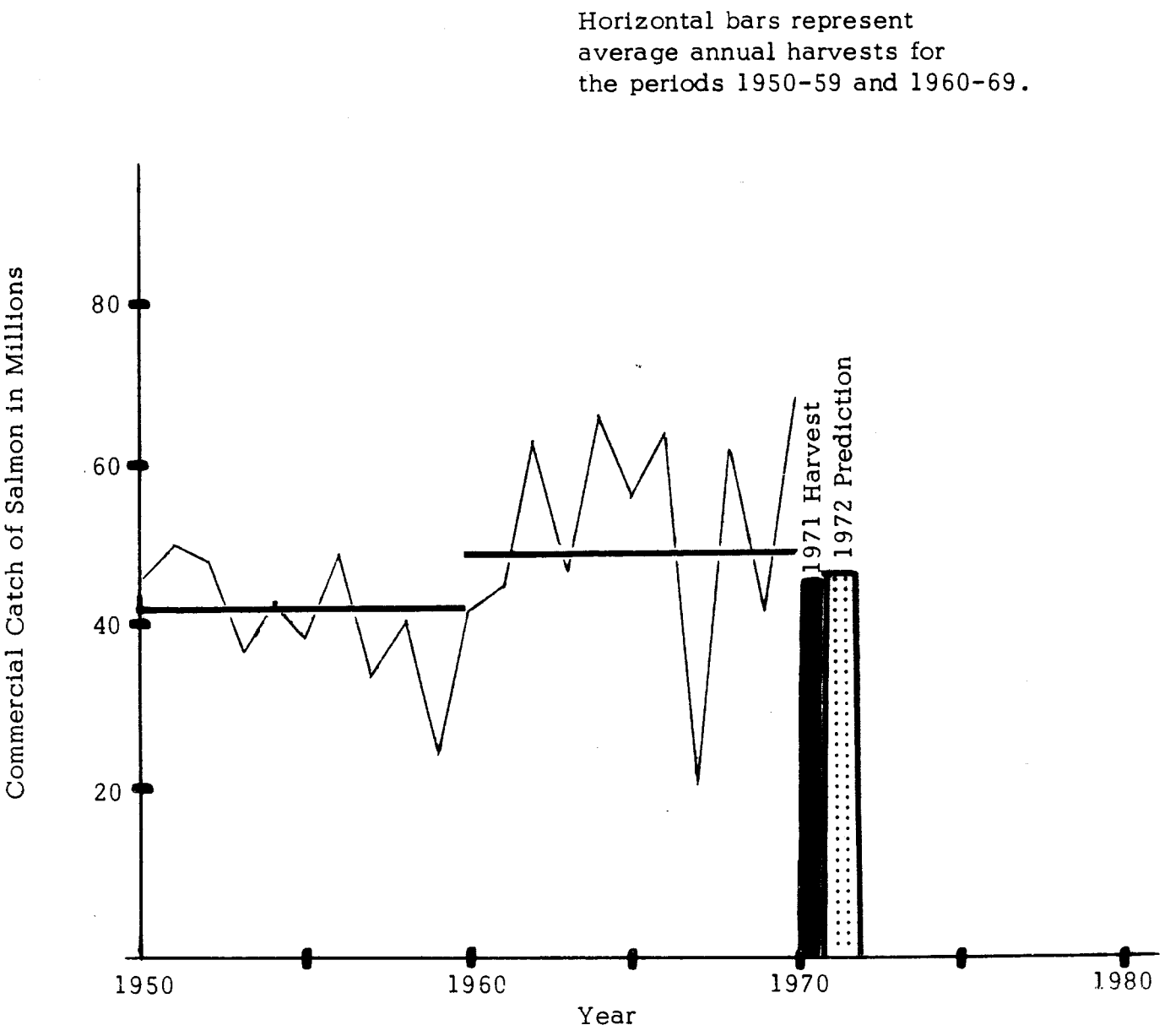
As illustrated in Figure 2, the projected 1972 harvest of 47 million salmon of all species compares favorably with the average of the 1960's. However, in comparison with the average, even-year harvest of nearly 60 million during the 1960's, the projected 1972 harvest is 13 million less. This is due, in part, to below average contributions expected in 1972 from Prince William Sound and Kodiak pink salmon fisheries.

Salmon predictions characteristically exhibit variations from actual returns which seem large when compared to prediction accuracy in some other fields. Errors up to 50 percent, and sometimes greater, are not uncommon in predicting salmon returns. These apparently large variations result from difficulties encountered in obtaining information on the myriad factors affecting survival throughout the salmon life cycle and in enumerating members of a population which is highly mobile, wide ranging and living in a water environment. Furthermore, data required for salmon predictions accumulate very slowly; the least complex salmon stocks require 5-10 years of data collection before reliable forecasts can be expected.

Although the accuracy with which salmon returns can be forecast varies with species, physical characteristics of the systems in which spawning and rearing occurs, harvest methods (harvest of mixed stocks further complicates forecasting) and other factors, the Department's long term goal is to provide forecasts with errors not to exceed $\pm$ 25 percent. As indicated above, this level of accuracy is not expected for specific fisheries until forecast studies have been conducted for a minimum of 5-10 years.

At present, the cost of obtaining highly precise forecasts, desirable perhaps from a purely scientific standpoint, is not justified from the standpoint of either fisheries management or the fishing industry. In fact, forecasts

FIGURE 2. ANNUAL COMMERCIAL HARVESTS OF ALASKAN SALMON, 1950-71.



exhibiting substantially more error than the goal of 25 percent, or less, can prove very valuable in some instances. For example, a pre-season forecast for a total return substantially less than minimum escapement requirements - a situation in which no significant harvest would be anticipated - could differ by 100 percent from the actual return and still be of value if the actual return did not allow a substantial harvest.

The importance of maintaining optimum spawning populations dictates that every effort be made to achieve escapement goals regardless of the actual magnitude of the salmon run. Therefore, variability between predicted and actual returns is generally also reflected between projected and actual harvests. Recognizing that deviations from forecasts are to be expected, and using levels of variation exhibited by past forecasts as guidelines, the effects of such variability occurring should be considered in pre-season operational planning.

APPENDIX A. PRELIMINARY FORECASTS, FORECAST TECHNIQUES AND DISCUSSION OF ANTICIPATED 1972 SEASON FOR MAJOR SALMON FISHERIES FOR WHICH FORECASTS OF TOTAL RETURNS ARE AVAILABLE

FORECAST AREA: Southeastern Alaska

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1972 TOTAL RETURN:

Northern Southeastern

Point Estimate = 12.0 million

Range Estimate = 12.0 - 14.0 million

Southern Southeastern

Point Estimate = 14.5 million

Range Estimate = 13.0 - 16.0 million

Total Southeastern

Point Estimate = 26.5 million

Range Estimate = 25.0 - 30.0 million

FORECAST METHODS:

The 1972 pink salmon forecast is based primarily on the relationship between weighted alevin indices and subsequent adult returns. Indices are weighted by average district escapements for years 1960-1970. Alevin index data collected since 1965 were used to establish the relationship. Because of the apparent separation of stocks between Northern and Southern Southeastern two forecasts are provided.

DISCUSSION OF 1972 FORECAST:

The predicted total return of 26.5 million pinks to Southeastern Alaska is comparable in size to the returns of 1964 and 1966.

In the Northern sector our alevin index-return data indicate the 1972 run should be within the range of 12.0-14.0 million fish. However, analysis of weather data and escapement-return relationships over the past five years indicate the return may be closer to the lower end of this range and may possibly be as low as 10.0

million. In view of these results and since forecasts in past years have been high for runs resulting from progeny subjected to unusually severe fall and winter conditions, the lower end of the 12.0 - 14.0 million range is selected for the point forecast of the Northern Southeastern pink salmon return.

In the Southern sector, the predicted range of return is 13.0 - 16.0 million. A range of similar magnitude was estimated by analysis of weather data and escapement-return relationships.

In the Northern district the desired escapement level is about 4 million pinks. Based on the predicted 12.0 million return the harvest will be near 8.0 million. As stated before, the return to the Northern sector may be as low as 10 million reducing the catch to 6.0 million. In the Southern districts the desired escapement level is about 6 million pinks. With a return estimate of 14.5 million the catch will be near 8.5 million.

The total catch for Southeastern Alaska assuming a correct forecast and the achievement of desired escapement goals will be 16.5 million pink salmon.

Prepared by: Kenneth Durley
Fisheries Research Biologist
Juneau

FORECAST AREA: Prince William Sound

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1972 TOTAL RETURN:

Point Estimate = 1.7 million

Range Estimate = 0 - 3.6 million

FORECAST METHODS:

Pink salmon forecasts in Prince William Sound (total run, district strength and timing) are based on alevin index.

DISCUSSION OF 1972 FORECAST:

The pink alevin index for the 1972 run is 85 per square meter. This is the lowest density observed since 1959. This could be the result of several factors. Winter temperatures were below normal when there was little snow cover. Precipitation during the spawning period was above normal. The spawner escapement for the parent year was the lowest since 1959.

The alevin index indicates a total pink salmon run of approximately 1.7 million fish (range 0 - 3.6 million). The spawner escapement goal for Prince William Sound is 1.5 million pinks. Assuming a total return of 1.7 million pink salmon in 1972, the run should receive little, if any fishing pressure. If the return is in the upper part of the forecast range, a limited commercial harvest of pinks will be possible in some areas.

SPECIES: Chum Salmon

PRELIMINARY FORECAST OF 1972 TOTAL RETURN:

Point Estimate = 800,000

Range Estimate = 700,000 - 900,000

FORECAST METHODS:

Chum salmon may mature as three, four or five year old fish. Forecasts

are based on a relationship that exists between the chum alevin index and the subsequent return of four-year old fish.

DISCUSSION OF 1972 FORECAST:

The chum alevin density of 81 per square meter for the parent year 1968 is the largest observed since 1960 and is expected to contribute approximately 90 percent of the 1972 chum run as four-year fish. This density indicates a run of about 720,000 four-year chums in 1972 and a total chum run of approximately 800,000.

Assuming a total chum run of 800,000 approximately 600,000 could be taken in the commercial harvest. However, the pink salmon run is expected to be low in 1972 and it may be necessary to not harvest some chums in order to secure an adequate escapement of the more important pinks. A major portion of the chums will be early and middle run fish that would appear with the pinks.

Prepared by: John D. Solf
Fisheries Research Biologist
Cordova

FORECAST AREA: Cook Inlet - Southern and Outer Districts Only

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1972 TOTAL RETURN:

Point Estimate = 750,000

Range Estimate = 400,000 - 1,100,000

FORECAST METHODS:

The 1972 pink salmon forecast for the Southern and Outer districts of Cook Inlet was derived by the relationship between alevin density and subsequent return. Indices of alevin abundance from six important spawning streams (normally nine streams are sampled but due to ice conditions only six were successfully sampled) are obtained in the spring prior to pink fry emergence. The densities from each stream are weighted by brood year escapement (normally alevin density is weighted by average escapement) and the resultant individual stream indices combined to arrive at a weighted alevin index for the two districts as a whole. This index is correlated with subsequent return and the regression line computed.

DISCUSSION OF 1972 FORECAST:

Good escapement was present in the pink salmon producing streams in 1970 of the Southern and Outer districts. Extremely cold weather was experienced during the winter of 1970-71 and the low alevin densities sampled in the Outer District streams indicated poor overwinter survival. Unfortunately, only two streams were sampled in the Southern District and these both showed relatively good alevin production. The other two major producing streams in the Southern District which are located geographically between the sampled streams, were not sampled due to heavy snow and ice cover preventing access to the streams prior to fry emergence. If it can be assumed that the unsampled streams will produce similar to the sampled streams, then the return should be close to the midpoint of the prediction. If overwinter survival was poor in the unsampled streams, then the return will be in the low range of the prediction. It can be safely assumed that the majority of the return will be present in the Southern District with very few fish returning to the Outer District.

If all streams receive the desired escapement levels, then 250,000 pink salmon are needed for escapement leaving approximately 500,000 available for harvest.

Prepared by: Allen Davis
Fisheries Research Biologist
Homer

FORECAST AREA: Kodiak

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1972 TOTAL RETURN:

Point Estimate = 9.5 million

Range Estimate = 7.9 - 11.1 million

FORECAST METHODS:

Forecasts of total pink salmon returns to the Kodiak area are based on the abundance of pre-emergent fry observed during the spring sampling period. Hydraulic sampling of 28 major pink salmon producing streams yielded a below-average density for the even-year cycle. A linear regression using all available years of pre-emergent fry data indicates the 1972 return at 9.5 million pink salmon. A range of approximately 7.9 - 11.1 million is associated with 80% confidence limits on the preliminary forecast.

DISCUSSION OF 1972 FORECAST:

The relative strengths of expected returns to major districts and catch associated districts in the Kodiak area (excluding the Mainland District) are indicated below:

(1) Afognak District. The generally poor densities obtained in this area indicate a return of about .8 million. The 1970 parent year return was 1.7 million for this district.

(2) Westside. This area includes the Uganik, Uyak, Karluk, Red River, and Sturgeon districts. The pre-emergent fry densities obtained in these districts were nearly all below the parent year densities. A relatively poor return of 2.1 million pink salmon is expected. Uyak River, Karluk River, and Red River should be the primary producers.

(3) Alitak District. Fry densities in this district compared favorably with the 1970 parent year densities except for a critical reduction in the Dog Salmon River. A return of about 1.2 million pink salmon is expected with Humpy River and Deadman River being the major producers.

(4) General District. This district extends from Kizhuyak Bay to Cape Trinity on the eastside of Kodiak Island. The General District should produce about 5.4 million pink salmon and thus constitute the bulk of the fishery. Rivers in Chiniak Bay and Seven Rivers should produce strong returns in this district.

Forecasts by district have, at times, been subject to error because they assume a projected pattern of catch similar to that of the parent year. Since the commercial effort varies with the timing and migration routes of the run, weather and regulations, fish destined for a particular district are often caught in neighboring districts. With these reservations in mind and if the 1972 return corresponds closely to the forecasted level of 9.5 million, an estimated 6.5 million pink salmon could be harvested.

Prepared by: Kenneth Manthey
Fisheries Research Biologist
Kodiak

FORECAST AREA: Chignik

SPECIES: Red Salmon

PRELIMINARY FORECAST OF 1972 TOTAL RETURN:

Early (Black Lake) Run

Point Estimate = 342,000

Late (Chignik Lake) Run

Point Estimate = 515,000

Chignik System Total = 857,000

FORECAST METHODS:

The forecast for the early or Black Lake run is actually a forecast of red salmon returning to the Chignik system prior to July 1. The majority of these fish are of .3 ocean age, and the magnitude of their return has in past years been related to the number of fish of .2 ocean age returning the year before. The 1971 return of .2's was only about 18,500. This is much smaller than the average yearly return since 1965 of 74,000 fish. A regression analysis of .2 ocean fish to .3 ocean fish the following year reveals a return of only 268,000 .3 ocean red salmon prior to July 1 in 1972. Assuming that an average number of .2 ocean fish will return, we can expect a total return of approximately 342,000 by July 1. This would be the lowest return since 1964. The parent year escapement of approximately 328,000 was good and should under normal conditions produce close to one million fish.

Forecasts, based on the above methods, of late or Chignik Lake red salmon runs have not been reliable. Until more reliable techniques are developed, it may be desirable to assume only that an average return will occur. Recent returns to this system have ranged from 315,000 to 775,000 with an average of approximately 515,000.

DISCUSSION OF 1972 FORECAST:

An escapement goal of approximately 400,000 spawners for the early or Black Lake system would dictate the necessity of dras-

tically curtailing fishing on these stocks if the 1972 run is near the forecasted level of 342,000. Little, if any, fishing time is therefore expected prior to July 1.

For the late or Chignik Lake system, an escapement goal of 250,000 would allow a harvest of approximately 265,000 red salmon after July 1 if the 1972 run is near the average level of 515,000.

Prepared by: Paul Pedersen
Fisheries Management Biologist
Kodiak

FORECAST AREA: Bristol Bay

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF 1972 TOTAL RETURN:

Point Estimate = 10.3 million

FORECAST METHODS:

Most Bristol Bay sockeye salmon mature after four, five or six years. The forecasted run for 1972 will, therefore, be progeny of the spawning escapements of 1966, 1967 and 1968. Forecasts of Bristol Bay sockeye salmon returns are based generally on one or more of the following three methods:

(1) Escapement-return relationships, based on past data, provide estimates of total return by system from parent year escapements. Returns to the Kvichak River, because of the distinct difference between peak and non-peak year escapement magnitudes, are forecasted from two sets of relationships, one for peak years, and another for non-peak years. Average age structures of past returns are applied to the total estimated return, and those fish expected in the forecasted year are added by system for a total forecasted return.

(2) On several systems, studies are conducted to evaluate production of the outmigrating fingerlings, called smolt, from each escapement. In some cases total outmigration estimates are made, while in other relative annual abundance of smolt is measured.

Past marine survival by smolt age class is applied to the smolt index of abundance to obtain an estimate of returning adults. Past ocean age structures are applied to the smolt-adult relationship estimates for forecasting numbers by age returning in a forecasted year.

(3) For all systems relationships have been developed between fish returning at a specific age in one year and fish from the same brood year of the same freshwater age returning in the following year. In cases where the relationship is reliable, the technique may be applied.

In any system modifications or combinations of the above may be applied. The choice of methods used depends on which data are available, and the tested or apparent consistency of each technique for the age class and system being forecasted.

DISCUSSION OF 1972 FORECAST:

The 1972 forecast is for a total inshore run of 10.3 million sockeye. Preliminary analysis indicates that the smaller .2-ocean fish will constitute approximately 55 percent of the total run.

Of the 10.3 million sockeye expected, 60 percent or 6.1 million fish are expected in the major Naknek-Kvichak district. An expected return of 3.8 million for the Kvichak River, major sockeye producer in Bristol Bay, represents a low non-peak year for this system. The predicted return of only 370,000 to the Ugashik district falls in the estimated optimum escapement range of 350,000 to 400,000; therefore, little or no commercial harvest is anticipated for this district. Returns expected for other systems compare closely with recent average levels.

Department escapement goals totaling 5.2 million sockeye for all systems would allow for a commercial harvest of 5.1 million from a total return of 10.3 million. The estimated harvests for fishing districts are as follows (number of fish in millions):

Naknek-Kvichak	2.968
Egegik	.965
Ugashik	Negligible
Nushagak-Igushik	1.130
Togiak	.049
Total Bristol Bay	5.112

Prepared by: Robert Paulus
Fisheries Research Biologist
Anchorage

FORECAST AREA: Bristol Bay - Nushagak District Only

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1972 TOTAL RETURN:

Point Estimate = 1.4 million

FORECAST METHODS:

Forecasts of pink salmon returns to the Nushagak district of Bristol Bay are based on escapement-return relationships. Severe winter and spring weather conditions prevent the collection of adequate pre-emergent fry data which forms the basis for pink salmon forecasting in other areas of the state. Escapement-return data is available since 1958. Escapements have been enumerated at counting towers since 1960.

DISCUSSION OF 1972 FORECAST:

In recent years, pink salmon returns to the Nushagak district have been of significant magnitude only on the even-years. An escapement of 153,000 in 1970 is expected to produce a return of approximately 1.4 million pink salmon in 1972. For comparison, returns since 1958 have varied from 436,000 in 1960 to 3.9 million in 1968.

An established escapement goal of approximately 600,000 pink salmon for the Nushagak system would allow a harvest of 800,000 from the predicted 1.4 million return. Variability of fishing effort in these stocks and difficulty in assessing the actual magnitude of the run during the season make achievement of escapement goals exceptionally difficult.

The Nushagak district generally contributes in excess of 90 percent of all pink salmon harvested in Bristol Bay.

Prepared by: Michael L. Nelson
Fisheries Management Biologist
Dillingham

APPENDIX B. ANNUAL ALASKA COMMERCIAL SALMON HARVEST BY SPECIES AND STATISTICAL REGION, 1950-1971

APPENDIX TABLE B. ANNUAL ALASKA COMMERCIAL SALMON HARVEST BY SPECIES AND STATISTICAL REGION, 1950-1971.

Year	Statistical Region 1/	Number of Fish in Thousands: Species						No. of 48-lb. Cases in Thousands 2/
		King	Red	Coho	Pink	Chum	Total	
1950	SOUTHEASTERN	379	552	1,652	9,424	4,779	16,786	1,199
	CENTRAL	137	5,947	762	11,978	2,515	21,339	1,465
	WESTERN	95	7,267	83	30	447	7,922	644
	Subtotal	611	13,766	2,497	21,432	7,741	46,047	3,308
1951	SOUTHEASTERN	474	820	3,310	22,211	4,123	30,938	2,028
	CENTRAL	213	4,136	645	6,185	2,040	13,219	1,068
	WESTERN	102	4,697	76	21	454	5,350	389
	Subtotal	789	9,653	4,031	28,417	6,617	49,507	3,485
1952	SOUTHEASTERN	528	919	1,746	9,819	4,179	17,191	1,321
	CENTRAL	115	4,341	617	10,012	3,463	18,548	1,456
	WESTERN	92	11,664	70	47	522	12,395	797
	Subtotal	735	16,924	2,433	19,878	8,164	48,134	3,574
1953	SOUTHEASTERN	498	1,376	1,164	4,980	3,542	11,560	978
	CENTRAL	112	3,763	387	10,602	3,132	17,996	1,351
	WESTERN	102	6,654	31	88	619	7,494	534
	Subtotal	712	11,793	1,582	15,670	7,293	37,050	2,863
1954	SOUTHEASTERN	398	1,208	1,771	8,909	4,242	16,528	1,303
	CENTRAL	85	3,190	679	12,576	3,323	19,853	1,395
	WESTERN	128	5,014	59	688	820	6,709	397
	Subtotal	611	9,412	2,509	22,173	8,385	43,090	3,095
1955	SOUTHEASTERN	372	681	1,338	9,334	1,527	13,252	840
	CENTRAL	74	2,675	468	14,758	1,631	19,606	1,163
	WESTERN	135	5,148	27	32	342	5,684	383
	Subtotal	581	8,504	1,833	24,124	3,500	38,542	2,386
1956	SOUTHEASTERN	239	921	935	13,472	2,736	18,303	1,032
	CENTRAL	82	3,432	495	11,940	3,674	19,623	1,349
	WESTERN	137	10,252	52	125	791	11,357	641
	Subtotal	458	14,605	1,482	25,537	7,201	49,283	3,022

APPENDIX TABLE B. ANNUAL ALASKA COMMERCIAL SALMON HARVEST BY SPECIES AND STATISTICAL REGION, 1950-1971 (cont.)

Year	Statistical Region 1/	Number of Fish in Thousands: Species						No. of 48-lb Cases in Thousands 2/
		King	Red	Coho	Pink	Chum	Total	
1957	SOUTHEASTERN	298	1,031	1,217	6,858	3,369	12,773	905
	CENTRAL	57	2,071	301	6,659	4,362	13,450	1,002
	WESTERN	158	6,631	87	4	548	7,428	557
	Subtotal	513	9,733	1,605	13,521	8,279	33,651	2,464
1958	SOUTHEASTERN	323	971	955	9,836	2,767	14,852	1,181
	CENTRAL	45	1,636	459	14,452	3,244	19,836	1,354
	WESTERN	182	3,460	193	1,809	613	6,257	437
	Subtotal	550	6,067	1,607	26,097	6,624	40,945	2,972
1959	SOUTHEASTERN	359	777	1,094	7,851	1,247	11,328	759
	CENTRAL	47	1,937	332	3,057	1,908	7,281	573
	WESTERN	195	5,249	76	22	886	6,428	446
	Subtotal	601	7,963	1,502	10,930	4,041	25,037	1,778
1960	SOUTHEASTERN	310	588	721	2,985	1,019	5,623	318
	CENTRAL	41	2,835	618	12,313	3,682	19,489	1,205
	WESTERN	196	14,411	66	782	1,923	17,378	1,049
	Subtotal	547	17,834	1,405	16,080	6,624	42,490	2,572
1961	SOUTHEASTERN	230	744	889	12,638	2,559	17,060	1,224
	CENTRAL	31	3,030	357	8,736	2,080	14,234	940
	WESTERN	243	12,307	67	132	991	13,740	1,048
	Subtotal	504	16,081	1,313	21,506	5,630	45,034	3,212
1962	SOUTHEASTERN	206	772	1,223	11,585	1,996	15,782	935
	CENTRAL	42	3,534	692	29,297	4,024	37,589	2,013
	WESTERN	213	4,990	124	2,981	1,128	9,436	528
	Subtotal	461	9,296	2,039	43,863	7,148	62,807	3,476
1963	SOUTHEASTERN	258	678	1,275	19,145	1,479	22,835	1,216
	CENTRAL	35	2,437	627	14,976	2,350	20,425	1,135
	WESTERN	208	3,101	121	154	635	4,219	305
	Subtotal	501	6,216	2,023	34,275	4,464	47,479	2,656

APPENDIX TABLE B. ANNUAL ALASKA COMMERCIAL SALMON HARVEST BY SPECIES AND STATISTICAL REGION, 1950-1971 (cont.)

Year	Statistical Region [1]	Number of Fish in Thousands: Species: King	Red	Coho	Pink	Chum	Total	No. of 48-lb Cases in Thousands [2]
1964	SOUTHEASTERN	357	924	1,588	18,581	1,936	23,386	1,263
	CENTRAL	22	3,198	866	24,945	4,160	33,191	1,724
	WESTERN	260	5,839	105	1,747	1,179	9,130	563
	Subtotal	639	9,961	2,559	45,273	7,275	65,707	3,550
1965	SOUTHEASTERN	287	1,085	1,548	10,880	1,474	15,274	758
	CENTRAL	31	4,229	393	9,464	1,635	15,752	985
	WESTERN	265	24,732	57	3	271	25,328	1,525
	Subtotal	583	30,046	1,998	20,347	3,380	56,354	3,268
1966	SOUTHEASTERN	308	1,054	1,227	20,438	3,273	26,300	1,562
	CENTRAL	24	4,458	574	17,028	2,574	24,658	1,532
	WESTERN	208	9,562	119	2,585	609	13,083	897
	Subtotal	540	15,074	1,920	40,051	6,456	64,041	3,991
1967	SOUTHEASTERN	301	972	866	3,111	1,810	7,060	431
	CENTRAL	26	3,049	450	3,409	1,198	8,132	609
	WESTERN	284	4,557	172	39	646	5,698	424
	Subtotal	611	8,578	1,488	6,559	3,654	20,890	1,464
1968	SOUTHEASTERN	332	831	1,543	25,085	2,644	30,435	1,372
	CENTRAL	20	4,260	875	16,664	2,837	24,656	1,437
	WESTERN	259	3,039	333	2,977	601	7,209	359
	Subtotal	611	8,130	2,751	44,726	6,082	62,300	3,168
1969	SOUTHEASTERN	314	812	596	4,870	561	7,153	292
	CENTRAL	38	3,650	274	20,565	1,644	26,171	1,412
	WESTERN	287	6,931	263	332	770	8,583	519
	Subtotal	639	11,393	1,133	25,767	2,975	41,907	2,223
1970 [3]	SOUTHEASTERN	322	668	759	10,657	2,446	14,851	676
	CENTRAL	33	6,020	647	19,263	3,609	29,571	1,661
	WESTERN	291	20,946	121	1,228	1,445	24,031	1,227
	Subtotal	646	27,634	1,527	31,147	7,500	68,454	3,565

APPENDIX TABLE B. ANNUAL ALASKA COMMERCIAL SALMON HARVEST BY SPECIES AND STATISTICAL REGION, 1950-1971 (cont.)

Year	Statistical Region 1/	Number of Fish in Thousands: Species: King	Red	Coho	Pink	Chum	Total	No. of 48-lb. Cases in Thousands 2/
1971 3/	SOUTHEASTERN	273	620	642	9,088	1,534	12,157	641
	CENTRAL	41	3,612	480	14,209	4,312	22,654	1,369
	WESTERN	272	9,619	44	51	1,202	11,188	769
	Subtotal	586	13,851	1,166	23,348	7,048	45,999	2,779

Data Sources: i) Alaska Department of Fish and Game Statistical Leaflet No. 19

ii) Alaska Department of Fish and Game Statistics Section. Unpublished data.

iii) Alaska Fisheries Reports, 1954-59. Bureau of Commercial Fisheries, U.S. Fish and Wildlife Service.

1/ For the purpose of reporting Alaska commercial fisheries statistics, the statistical regions are defined as follows:

SOUTHEASTERN: Dixon Entrance to Cape Suckling

CENTRAL: Cape Suckling to Seal Cape on the southwestern tip of Unimak Island

WESTERN: Seal Cape to, and including, the Aleutian Islands and the Bering Cape north through Kotzebue Sound.

2/ Although the majority of commercially harvested salmon in Alaska are processed as canned products, in some regions certain species (such as king and coho salmon in the Southeastern region) are processed predominantly as fresh/frozen or cured products. These case pack figures do not include salmon processed in ways other than canning.

3/ Preliminary data